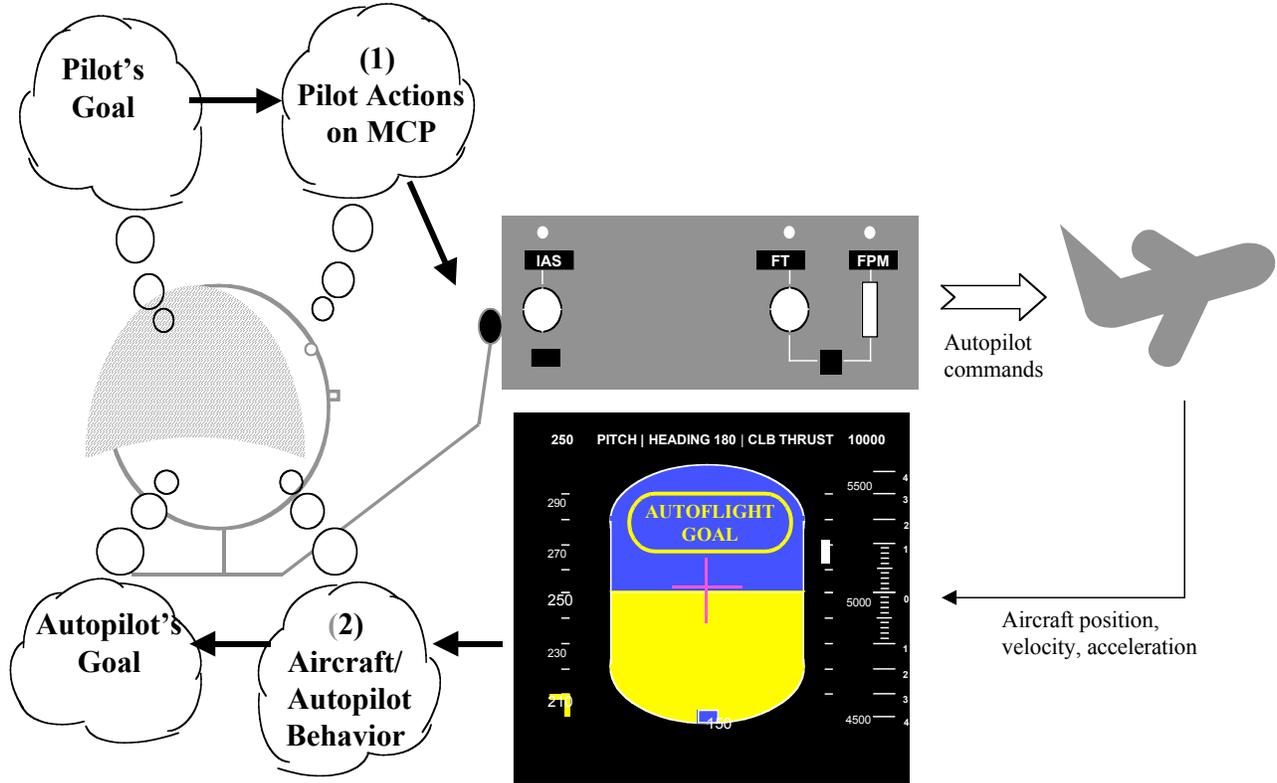


# AUTOPILOT TUTOR WORKBOOK



## Autopilot Tutor Workbook

The Autopilot Tutor provides training on the automated behavior of the Autopilot. When you have completed the training you will be able to stay-ahead of the Autopilot by explaining and predicting the behavior of the Autopilot. You will specifically be able to answer the following questions of the Autopilot:

- “What is it doing now?”
- “Why did it do that?”
- “When does this happen?”
- “What will it do next?”

This training supplements Autopilot System Description training and Standard Operating Procedure (SOP) training. (In the future, the Autopilot behavior training in this tutor may be embedded in the System Description and SOP's.)

The Autopilot Tutor system includes: (1) a workbook and (2) an interactive web-based tutor. This workbook provides the instructional plan.

The web-based tutor can be found at [http://\\_\\_\\_\\_\\_](http://_____). The web-based tutor supplements the workbook by providing an environment for experiential operation of the Autopilot and Primary Flight Display (PFD) and exploratory learning. As one develops proficiency in hand-flying, so one should develop proficiency in operating the Autopilot. This interactive tutor is the way to practice and build this proficiency.

This tutor is unique in the way it uses a goal-based model, also known as label-following, to train the material. This method has been demonstrated to train to competence in a shorter time than other traditional training methods.

Follow the instructions in this workbook to operate the web-based tutor.

## LOFT

### **Instructions:**

This LOFT tests your knowledge on the operation of the Autopilot. There are two specific skills that are tested:

- (1) knowledge for transferring pilot goals to the Autopilot via pilot MCP actions
- (2) knowledge for interpreting the correct Autopilot behavior from FMA and PFD cues

The LOFT is organized into four sections:

- 1) Transferring Pilot Goals via the MCP Altitude Knob
- 2) Transferring Pilot Goals via the MCP Vertical Speed Wheel (Part I)
- 3) Transferring Pilot Goals via the MCP Vertical Speed Wheel (Part II)
- 4) Transferring Pilot Goals via the MCP Vertical Speed Wheel (Part III)

Each section is organized in a sequence: situation – event - question – action.

You will initialize the AP Tutor in a specific situation. An event will occur, such as an ATC instruction, and you will be asked some questions about pilot actions to transfer goals to the Autopilot. Finally you will perform pilot actions and fly the aircraft into the next situation.

There are a total of 38 questions.

**Configure the AP TUTOR to display AUTOFLIGHT GOALS (no labels)**

## Transferring Pilot Goal via the MCP Altitude Knob

Initialize the Autopilot Tutor (select the INIT button)

### **Situation:**

Departing PDX.

The aircraft is level at the MCP Altitude of 5000 ft at the MCP Airspeed of 250 knots.

The Speed || Altitude FMA reads THRUST || HOLD  
The PFD Altitude Bug on the PFD Altitude Tape is at 5000'  
The Autopilot goal is MAINTAIN MCP ALT

### **Event:**

ATC: "NASA14, radar contact, climb maintain 6000' "

### **ANSWER THE FOLLOWING QUESTION DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

#### **Question 1:**

What pilot action on the MCP is required to meet the ATC instruction "climb and maintain 6000' "?

(Select one of the following)

- Dial up MCP Altitude to 6000
- Dial up MCP Altitude to 6000 and pull MCP Altitude Knob
- Rotate Vertical Speed Wheel to 800 fpm
- Push MCP Altitude Knob

### **ANSWER THE FOLLOWING QUESTION DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

#### **Question 2:**

What SPEED || ALTITUDE FMA will be displayed when you dial up the MCP Altitude to 6000 and pull on the MCP Altitude Knob?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP

### **Automatic Change in Autopilot Goals**

#### **Pilot Action:**

Dial up the MCP Altitude to 6000 and pull the MCP Altitude Knob.

- Monitor the Speed || Altitude FMA change to PITCH || CLB THRUST
- Monitor the Altitude Bug on the PFD Altitude Tape change to 6000'
- Monitor the Autopilot goal change to CLIMB MAINTAIN MCP ALT.

#### **Pilot Action:**

FLY the aircraft to 5600

Monitor the climb to 5600'

#### **Situation:**

The aircraft is ascending through 5600' with vertical speed of approx. 1100 fpm.

The Speed || Altitude FMA reads PITCH || CLB THRUST  
The Altitude Bug on the PFD Altitude Tape is at 6000'  
The Autopilot goal is CLIMB MAINTAIN MCP ALT.

### **ANSWER THE FOLLOWING QUESTION DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

#### **Question 3:**

How far away (altitude) from the MCP Altitude will the aircraft initiate the nose-down to capture the MCP Altitude?

(Select one of the following)

- 120'
- 180'

- 1000'
- 5020'

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 4:**

What SPEED || ALTITUDE FMA will be displayed when the Autopilot initiates a nose-down capture of the MCP Altitude ?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP

**Pilot Action:**

FLY the aircraft to 5900

- Monitor climb to 5900'
- The Speed || Altitude FMA reads THRUST || HOLD
- The Altitude Bug on the PFD Altitude Tape is at 6000'
- The Autopilot goal is to CLIMB MAINTAIN MCP ALT - CAP.

**Situation:**

The aircraft is ascending through 5900' with vertical speed 900 fpm.

The Speed || Altitude FMA reads THRUST || HOLD

The Altitude Bug on the PFD Altitude Tape is at 6000'

The Autopilot goal is to CLIMB MAINTAIN MCP ALT - CAP.

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 5:**

What SPEED || ALTITUDE FMA will be displayed when the aircraft is within 60 ft of the MCP Altitude and with vertical speed less than 300 fpm?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP

**Pilot Action:**

FLY the aircraft to 6000.

FLY the aircraft until vertical speed is zero.

- Monitor the Speed || Altitude FMA reads THRUST || HOLD
- Monitor the Altitude Bug on the PFD Altitude Tape is at 6000'
- Monitor the Autopilot goal is to MAINTAIN MCP ALT

**Situation:**

The aircraft is level at 6000' with vertical speed 0 fpm.

The Speed || Altitude FMA reads THRUST || HOLD

The Altitude Bug on the PFD Altitude Tape is at 6000'

The Autopilot goal is to MAINTAIN MCP ALT

**Transferring Pilot Goals via the MCP Altitude Knob**

**Event:**

ATC: "NASA14 radar contact, climb maintain 7000' "

**Pilot Action:**

Dial the MCP Altitude to 7000' and pull the MCP Altitude Knob.

- Monitor the Speed || Altitude FMA change to PITCH || CLB THRUST
- Monitor the PFD Altitude Target change to the MCP Altitude at 7000'
- Monitor the Autopilot goal change to CLIMB MAINTAIN MCP ALT

**Pilot Action:**

FLY the aircraft to 6400'

Monitor the climb to 6400'

**Situation:**

The aircraft is ascending through 6400' with vertical speed approx. 700 fpm.

The Speed || Altitude FMA reads PITCH || CLB THRUST

The PFD Altitude Target is the MCP Altitude at 7000'

The Autopilot goal is CLIMB MAINTAIN MCP ALT

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 6:**

What SPEED || ALTITUDE FMA will be displayed *if* the MCP Altitude is dialed up to 8000' (no pull on MCP Altitude Knob) ?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 7:**

What SPEED || ALTITUDE FMA will be displayed *if* the MCP Altitude is dialed up to 8000' and the MCP Altitude Knob is pulled ?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP

**Pilot Action:**

Dial the MCP Altitude to 8000' (no knob pull)

- The Speed || Altitude FMA reads PITCH || CLB THRUST
- The PFD Altitude Target is the MCP Altitude at 8000'
- The Autopilot goal is CLIMB MAINTAIN MCP ALT - CAP

FLY the aircraft through the capture to 7700'

- Monitor the climb to 7700'
- The Speed || Altitude FMA reads THRUST || HOLD
- The PFD Altitude Target is the MCP Altitude at 8000'
- The Autopilot goal is CLIMB MAINTAIN MCP ALT - CAP

**Situation:**

The aircraft is nosing down to capture 8000'.

The Speed || Altitude FMA reads THRUST || HOLD  
 The PFD Altitude Target is the MCP Altitude at 8000'  
 The Autopilot goal is CLIMB MAINTAIN MCP ALT - CAP

**ANSWER THE FOLLOWING QUESTION  
 DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 8:**

What SPEED || ALTITUDE FMA will be displayed *if* the MCP Altitude Knob is *pulled*?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 9:**

What SPEED || ALTITUDE FMA will be displayed *if* the MCP Altitude is dialed up to 9000' and the MCP Altitude Knob is pulled?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP

**Pilot Action:**

FLY the aircraft to 8000'  
FLY the aircraft to vertical speed of zero

- Monitor the capture and level-off to 8000'
- Monitor the SPEED || ALTITUDE FMA change to THRUST || HOLD
- Monitor the Altitude Bug on the PFD Altitude Tape remains at 8000
- Monitor the Autopilot goal change to MAINTAIN MCP ALT

## **Transferring Pilot Goals via the MCP Vertical Speed Wheel (Part I)**

Initialize the Autopilot Tutor (select the INIT button)

### **Situation:**

Departing PDX.

The aircraft is level at the MCP Altitude of 5000 ft at the MCP Airspeed of 250 knots.

The Speed || Altitude FMA is THRUST || HOLD  
The PFD Altitude Target is the MCP Altitude at 5000'  
The Autopilot goal is MAINTAIN MCP ALT

### **Event:**

ATC: "NASA14, radar contact, climb maintain 8000' "

### **Pilot Action:**

Dial MCP Altitude to 8000' and pull the MCP Altitude Knob.

- Monitor the SPEED || ALTITUDE FMA change to PITCH || CLB THRUST
- Monitor the Altitude Bug on the PFD Altitude Tape change to MCP Altitude at 8000'
- Monitor the Autopilot goal change to CLIMB MAINTAIN MCP ALT

### **Pilot Action:**

FLY the aircraft to 5300'

Monitor the climb to 5300'

### **Situation:**

The aircraft is ascending through 5300' ft approx. 600fpm.

Aircraft is 2 nm. from next waypoint, XREST.

The Speed || Altitude FMA is PITCH || CLB THRUST  
The Altitude Bug on the PFD Altitude Tape is the MCP Altitude at 8000'  
The Autopilot goal is CLIMB MAINTAIN MCP ALT

### **Event:**

ATC : “NASA14 expedite climb through 8000 for traffic. Cross XREST at 8000”

Captain: “Set rate of climb to 2800 fpm.”

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 10:**

What pilot action on the MCP is required to meet the captain’s goal of rate of climb of 2800 fpm ?

(Select one of the following)

- Dial up MCP Altitude to 8000
- Dial up MCP Altitude to 8000 and pull MCP Altitude Knob
- Rotate Vertical Speed Wheel up to +2800 fpm
- Push MCP Altitude Knob

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 11:**

What SPEED || ALTITUDE FMA will be displayed when you rotate the MCP Vertical Speed Wheel to +2800 fpm?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP

**Pilot Action:**

Rotate MCP Vertical Speed to 2800fpm.

- Monitor the Speed || Altitude FMA reads THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is the MCP Altitude

- at 8000'
- Monitor the VS Bug on the PFD VS Tape is the MCP VS at 2800 fpm.
  - Monitor the Autopilot goal changes to CLIMB MAINTAIN MCP ALT - ROC.

**Pilot Action:**

FLY the aircraft to 6900'

- Monitor the climb to 6900'
- Monitor the Speed || Altitude FMA reads THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is the MCP Altitude at 8000'
- Monitor the VS Bug on the PFD VS Tape is the MCP VS at 2800 fpm.
- Monitor the Autopilot goal is CLIMB MAINTAIN MCP ALT - ROC.

**Situation:**

The aircraft is ascending through 6900' with vertical speed approx. 2,800 fpm.

**ANSWER THE FOLLOWING QUESTION  
DO NO PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 12:**

How far away (altitude) from the aircraft will the Altitude Bug enter the capture region (and the aircraft initiate a nose-down for the capture of the MCP Altitude) ?

(Select one of the following)

- 1100' – 1000'
- 1000' – 900'
- 500'
- 100'

**ANSWER THE FOLLOWING QUESTION  
DO NO PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 13:**

What SPEED || ALTITUDE FMA will be displayed when the Autopilot initiates a nose-down capture of the MCP Altitude

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP

**Pilot Action:**

FLY the aircraft to 7000'

- Monitor the Speed || Altitude FMA change to THRUST || HOLD
- Monitor the Altitude Bug on the PFD Altitude Tape is the MCP Altitude at 8000' and is in the capture region.
- Monitor the Autopilot goal change to CLIMB MAINTAIN MCP ALT – CAP

**Situation:**

The aircraft is ascending through 7000' with vertical speed 2800 fpm.

The Speed || Altitude FMA reads THRUST || HOLD

The Altitude Bug on the PFD Altitude Tape is the MCP Altitude at 8000' and is in the capture region

The Autopilot goal is to CLIMB MAINTAIN MCP ALT - CAP.

**Event:**

Captain : “Reduce rate of climb to +1000 fpm [to smooth-out capture]”

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTION ON THE AP TUTOR**

**Question 14:**

What pilot action on the MCP is required to meet the pilot goal?

(Select one of the following)

- Dial MCP Altitude to 9000
- Dial MCP Altitude to 8000 and pull MCP Altitude Knob
- Rotate Vertical Speed Wheel down to +1000 fpm
- Push MCP Altitude Knob

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTION ON THE AP TUTOR**

**Question 15:**

(Select one of the following)

What SPEED || ALTITUDE FMA will be displayed when the pilot rotates the MCP Vertical Speed Wheel down to +1000 fpm?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP
- CLIMB AWAY MCP ALT 2 SECS
- CLIMB AWAY MCP ALT - ROC

**Pilot Action:**

Rotate the MCP Vertical Speed Wheel to + 1000 fpm.

- Monitor the Speed || Altitude FMA change to THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is the MCP Altitude at 8000'
- Monitor the VS Bug on the PFD VS Tape is the MCP VS at +1000 fpm
- Monitor the Autopilot goal change to CLIMB AWAY MCP ALT – 2 SECS

**Automatic Transition of Autopilot Goals**

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTION ON THE AP TUTOR**

**Question 16:**

Where will the Altitude Bug be, relative to the capture region, 2 seconds after the MCP Vertical Speed Wheel is rotated to +1000 fpm?

(Select one of the following)

- not in the capture region yet (Altitude bug is above an 0.03g capture from current altitude)
- within the climb capture region (Altitude Bug is at the 0.03g capture from current altitude)
- already past the climb capture region (Altitude Bug is already past the 0.03g capture from current altitude)
- within 60 ft of the aircraft

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTION ON THE AP TUTOR**

**Question 17:**

What SPEED || ALTITUDE FMA will be displayed when the Altitude Bug is above the capture region 2 seconds after the MCP Vertical Speed Wheel is rotated to + 1000 fpm?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT
- CLIMB MAINTAIN MCP ALT – ROC
- CLIMB MAINTAIN MCP ALT – CAP
- CLIMB AWAY MCP ALT 2 SECS
- CLIMB AWAY MCP ALT - ROC

**Pilot Action:**

FLY the aircraft to 7100' (Note: 2 seconds have elapsed)

- Monitor the climb to 7100'
- Monitor the Speed || Altitude FMA change to THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is the MCP Altitude at 8000'

- Monitor the VS Bug on the PFD VS Tape is the MCP VS at 1000 fpm
- Monitor the Autopilot goal change to CLIMB MAINTAIN MCP ALT – ROC.

**Pilot Action:**

FLY the aircraft to 8000' and FLY vertical speed is zero

- Monitor the Speed || Altitude FMA change to THRUST || HOLD
- Monitor the Altitude Bug on the PFD Altitude Tape is the MCP Altitude at 8000'
- Monitor the Autopilot goal change to MAINTAIN MCP ALT

## **Transferring Pilot Goals via the MCP Vertical Speed Wheel (Part II)**

Initialize the Autopilot Tutor (select the INIT button)

### **Situation:**

Arriving SEA.

The aircraft is level at the MCP Altitude of 5000 ft at the MCP Airspeed of 250 knots.

The Speed || Altitude FMA is THRUST || HOLD  
The Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 5000'  
The Autopilot goal is MAINTAIN MCP ALT

### **Event:**

ATC: "NASA14, radar contact, descend maintain 3000' "

### **Pilot Action:**

Dial MCP Altitude to 3000' and pull the MCP Altitude Knob.

- Monitor the Speed || Thrust FMA change to PITCH ||IDLE
- Monitor the Altitude Bug on the PFD Altitude Tape change to 3000
- Monitor the Autopilot goal change to DESCEND MAINTAIN MCP ALT.

### **Pilot Action:**

FLY the aircraft to 4700'

Monitor the descent to 4700'

### **Situation:**

The aircraft is descending through 4700' ft approx. 600fpm.

The Speed | | Thrust FMA is PITCH ||IDLE  
The Altitude Bug on the PFD Altitude Tape change to 3000  
Autopilot goal is DESCEND MAINTAIN MCP ALT.

### **Event:**

Captain: “Increase rate of descent to 2000 fpm.”

**ANSWER THE FOLLOWING QUESTIONS  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 18:**

What pilot actions are required to achieve the goal to set the rate of descent to 2000 fpm? (Note: current vertical speed is -600 fpm)

(Select one of the following)

- Pull MCP Altitude knob
- Dial MCP Altitude to 4000' and pull the MCP Altitude Knob
- Rotate the MCP VS Wheel to -2000 fpm
- Push the MCP Altitude Knob

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 19:**

What SPEED || ALTITUDE FMA will be displayed when you rotate the MCP Vertical Speed Wheel to -2000 fpm?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT – ROD
- DESCEND MAINTAIN MCP ALT – CAP

**Pilot Action:**

Rotate the MCP Vertical Speed Wheel to -2000 fpm

- Monitor the SPEED || ALTITUDE FMA change to THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000'

- Monitor the Vertical Speed Bug on the PFD VS Tape is at –2000 fpm.
- Monitor the Autopilot goal change to DESCEND MAINTAIN MCP ALT – ROD

**Pilot Action:**

FLY the aircraft to 3600'

- Monitor the SPEED || ALTITUDE FMA change to THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000'
- Monitor the Vertical Speed Bug on the PFD VS Tape is at –2000 fpm.
- Monitor the Autopilot goal change to DESCEND MAINTAIN MCP ALT – ROD

**Situation:**

The aircraft is descending through 3600' with vertical speed -2,000 fpm.

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 20:**

How far away (altitude) from the aircraft will the Altitude Bug enter the capture region (and the aircraft nose-up to initiate a capture of the MCP Altitude)?

- 400' – 500'
- 500' – 600'
- 100'
- 1000' – 1100'

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 21:**

What SPEED || ALTITUDE FMA will be displayed when the Autopilot initiates a nose-up capture of the MCP Altitude at 3500'?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

What Autopilot goal will be invoked

(Select one of the following)

- MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT
- DECDEND MAINTAIN MCP ALT – ROD
- DESCEND MAINTAIN MCP ALT – CAP

**Pilot Action:**

FLY the aircraft to 3500'

- Monitor the capture
- The Speed || Altitude FMA reads THRUST || HOLD
- The Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000'
- The Autopilot goal is to DESCEND MAINTAIN MCP ALT - CAP.

**Situation:**

The aircraft is descending through 3500' with vertical speed -2000 fpm.

The Speed || Altitude FMA reads THRUST || HOLD

The Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000'

The Autopilot goal is to DESCEND MAINTAIN MCP ALT - CAP.

**Event:**

Captain: "Reduce rate of descent to -1800 fpm."

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTION ON THE AP TUTOR**

**Question 22:**

What pilot action on the MCP is required to meet the pilot goal of rate of descent at 1800 fpm?

(Select one of the following)

- Dial MCP Altitude to 2000
- Dial MCP Altitude to 3000 and pull MCP Altitude Knob
- Rotate Vertical Speed Wheel to -1800 fpm
- Push MCP Altitude Knob

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTION ON THE AP TUTOR**

**Question 23:**

What SPEED || ALTITUDE FMA will be displayed when the pilot rotates the MCP Vertical Speed Wheel to -1800 fpm?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT – ROD
- DESCEND MAINTAIN MCP ALT – CAP
- DESCEND AWAY MCP ALT 2 SECS – ROD
- DESCEND AWAY MCP ALT – ROC

**Pilot Action:**

Rotate the MCP Vertical Speed Wheel up to –1800 fpm.

- Monitor the Speed || Altitude FMA change to THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is at 3000
- Monitor the VS Bug on the PFD VS Tape is at 1800 fpm'
- Monitor the Autopilot goal change to DESCEND AWAY MCP ALT – 2 SECS.

**Automatic Transition of Autopilot Goals**

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTION ON THE AP TUTOR**

**Question 24:**

Where will the Altitude Bug be, relative to the capture region, 2 seconds after the MCP Vertical Speed Wheel is rotated to –1800 fpm (Note: current aircraft vertical speed is –2000 fpm)

(Select one of the following)

- not in the capture region yet (Altitude bug is above an 0.03g capture from current altitude)
- within the climb capture region (Altitude Bug is at the 0.03g capture from current altitude)
- already past the climb capture region (Altitude Bug is already past the 0.03g capture from current altitude)
- within 60 ft of the aircraft

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTION ON THE AP TUTOR**

**Question 25:**

What SPEED || ALTITUDE FMA will be displayed 2 seconds after the MCP Vertical Speed Wheel is rotated to -1800 fpm

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

What Autopilot goal will be invoked

(Select one of the following)

- MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT - ROD
- DESCEND MAINTAIN MCP ALT - CAP
- DESCEND AWAY MCP ALT 2 SECS - ROD
- DESCEND AWAY MCP ALT - ROD

**Pilot Action:**

FLY the aircraft to 3300' (Note: 2 seconds have elapsed)

- Monitor the Speed || Altitude FMA change to THRUST || HOLD
- Monitor the Altitude Bug on the PFD Altitude Tape is at 3000'
- Monitor the Autopilot goal change to DESCEND MAINTAIN MCP ALT - CAP.

**Situation:**

The aircraft is descending through 3300'

The Speed || Altitude FMA is THRUST || HOLD

The Altitude Bug on the PFD Altitude Tape is at 3000'  
The Autopilot goal is DESCEND MAINTAIN MCP ALT – CAP.

**Pilot Action:**

FLY the aircraft to 3000'

- Monitor the Speed || Altitude FMA change to THRUST || HOLD
- Monitor the Altitude Bug on the PFD Altitude Tape is the MCP Altitude at 3000'
- Monitor the Autopilot goal change to MAINTAIN MCP ALT

**Situation:**

The aircraft is level at 3000' with vertical speed 0 fpm.

The Speed || Altitude FMA is THRUST || HOLD  
The Altitude Bug on the PFD Altitude Tape is the MCP Altitude at 3000'  
The Autopilot goal is MAINTAIN MCP ALT

## **Transferring Pilot Goals via the MCP Vertical Speed Wheel (Part III)**

Initialize the Autopilot Tutor (select the INIT button)

### **Situation:**

Arriving SEA.

The aircraft is level at the MCP Altitude of 5000 ft at the MCP Airspeed of 250 knots.

The Speed || Altitude FMA is THRUST || HOLD

The Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 5000'

The Autopilot goal is MAINTAIN MCP ALT

### **Event:**

ATC: "NASA14, radar contact, descend maintain 3000' "

### **Pilot Action:**

Dial MCP Altitude to 3000' and pull the MCP Altitude Knob.

- Monitor the SPEED || ALTITUDE FMA change to PITCH || IDLE
- Monitor the Altitude Bug on the PFD Altitude Tape changes to 3000'
- Monitor the Autopilot goal change to DESCEND MAINTAIN MCP ALT.

### **Pilot Action:**

FLY the aircraft to 4700'

- Monitor the descent to 4700'
- The Speed | | Thrust FMA is PITCH || IDLE
- The Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000'
- Autopilot goal is DESCEND MAINTAIN MCP ALT.

### **Situation:**

The aircraft is descending through 4700' ft at approx. 600fpm.

The Speed | | Thrust FMA is PITCH || IDLE

The Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000'

Autopilot goal is DESCEND MAINTAIN MCP ALT.

**Event:**

Captain: “Set rate of descent to 2000 fpm.

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE MCP ALTITUDE**

**Question 26:**

What pilot action on the MCP is required to meet the goal to perform the descent at 2000 fpm?

(Select one of the following)

- Dial MCP Altitude to 2000
- Dial MCP Altitude to 3000 and pull MCP Altitude Knob
- Rotate Vertical Speed Wheel to -2000 fpm
- Push MCP Altitude Knob

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE MCP ALTITUDE**

**Question 27:**

What SPEED || ALTITUDE FMA will be displayed when you rotate the MCP Vertical Speed Wheel to -2000 fpm?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT – ROD
- DESCEND MAINTAIN MCP ALT – CAP

**Pilot Action:**

Rotate MCP Vertical Speed Wheel to –2000 fpm.

- Monitor the SPEED || ALTITUDE FMA change to THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape remains at 3000'
- Monitor VS Bug on the PFD VS Tape changes to -2000 fpm
- Monitor the Autopilot goal change to DESCEND MAINTAIN MCP ALT - ROD.

**Pilot Action:**

FLY the aircraft to 4600'.

Monitor the descent to 4600'

**Situation:**

The Speed || Altitude FMA reads THRUST || V/S  
The Altitude Bug on the PFD Altitude Tape remains at 3000'  
The VS Bug on the PFD VS Tape changes to -2000 fpm  
The Autopilot goal changes to DESCEND MAINTAIN MCP ALT - ROD.

**Pilot Action:**

FLY the aircraft to 3600'

- Monitor the descent to 3600'
- The Speed || Altitude FMA reads THRUST || V/S
- The Altitude Bug on the PFD Altitude Tape remains at 3000'
- The VS Bug on the PFD VS Tape changes to -2000 fpm
- The Autopilot goal remains at DESCEND MAINTAIN MCP ALT - ROD.

**Situation:**

The aircraft is descending through 3600' at vertical speed 2,000 fpm.

The Speed || Altitude FMA reads THRUST || V/S  
The Altitude Bug on the PFD Altitude Tape remains at 3000'  
The VS Bug on the PFD VS Tape is at -2000 fpm  
The Autopilot goal remains at DESCEND MAINTAIN MCP ALT - ROD.

**ANSWER THE FOLLOWING QUESTION**

**DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR****Question 28:**

How far away (altitude) from the aircraft will the Altitude Bug enter the capture region (and the aircraft nose-up to initiate a capture of the MCP Altitude)?

- 400' – 500'
- 500' – 600'
- 900'
- 1000'

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR****Question 29:**

What SPEED || ALTITUDE FMA will be displayed when the Autopilot initiates a nose-up capture of the MCP Altitude at 3500'?

(Select one of the following)

- THRUST || HOLD
- PITCH || CLB THRUST
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT
- DECDEND MAINTAIN MCP ALT – ROD
- DESCEND MAINTAIN MCP ALT – CAP

**Pilot Action:**

FLY the aircraft to 3500'

- Monitor the Speed || Altitude FMA reads THRUST || HOLD
- Monitor the Altitude Bug on the PFD Altitude Tape is set to 3000'
- Monitor the Autopilot goal is to DESCEND MAINTAIN MCP ALT - CAP.

**Situation:**

The aircraft is descending through 3500' with vertical speed 2000 fpm.

The Speed || Altitude FMA reads THRUST || HOLD  
 The Altitude Bug on the PFD Altitude Tape is set to 3000'  
 The Autopilot goal is to DESCEND MAINTAIN MCP ALT - CAP.

**Event:**

Captain: "Increase the rate of descent to 3000 fpm."

**ANSWER THE FOLLOWING QUESTION  
 DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 30:**

What pilot action on the MCP is required to achieve the pilot goal of descent at 3000 fpm?

(Select one of the following)

- Dial MCP Altitude to 2000
- Dial MCP Altitude to 3000 and pull MCP Altitude Knob
- Rotate Vertical Speed Wheel to -3000 fpm
- Push MCP Altitude Knob

**ANSWER THE FOLLOWING QUESTION  
 DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 31:**

What SPEED || ALTITUDE FMA will be displayed when the pilot rotates the MCP Vertical Speed Wheel to -3000 fpm?

(Select one of the following)

- THRUST || HOLD
- PITCH || IDLE
- THRUST || V/S
- PITCH || IDLE

What Autopilot goal will be invoked

(Select one of the following)

- MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT – ROD
- DESCEND MAINTAIN MCP ALT – CAP
- DESCEND AWAY MCP ALT 2 SECS – ROD

- DESCEND AWAY MCP ALT - ROD

**Pilot Action:**

Rotate MCP Vertical Speed Wheel to -3000 fpm

- Monitor the Speed || Altitude FMA reads THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is set to the MCP Altitude at 3000'
- Monitor the VS Bug on the PFD VS Tape is at the MCP VS at -3000 fpm
- Monitor the Autopilot goal is to DESCEND MAINTAIN MCP ALT - ROD.

**Automatic Transition of Autopilot Goals**

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 32:**

Where will the Altitude Bug be, relative to the capture region, 2 seconds after the MCP Vertical Speed Wheel is rotated to -3000 fpm (Note: current vertical speed is 2000 fpm)

(Select one of the following)

- not in the capture region yet (Altitude bug is above an 0.03g capture from current altitude)
- within the climb capture region (Altitude Bug is at the 0.03g capture from current altitude)
- already past the climb capture region (Altitude Bug is already past the 0.03g capture from current altitude)
- within 60 ft of the aircraft

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 33:**

What SPEED || ALTITUDE FMA will be displayed 2 seconds after the MCP Vertical Speed is rotated to -3000 fpm ?:

(Select one of the following)

THRUST || HOLD  
 PITCH || CLB THRUST  
 THRUST || V/S  
 PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT
- DESCEND MAINTAIN MCP ALT – ROD
- DESCEND MAINTAIN MCP ALT – CAP
- DESCEND AWAY MCP ALT 2 SECS – ROD
- DESCEND AWAY MCP ALT - ROD

### Pilot Action:

FLY the aircraft to 3400' (Note: 2 seconds has elapsed)

- Monitor the Speed || Altitude FMA is THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000' (Note: the aircraft will fly through the Altitude Bug)
- Monitor the VS Bug on the PFD VS Tape is at the MCP VS at –3000 fpm
- Monitor the Autopilot goal is DESCEND AWAY MCP ALT – ROD.

### Situation:

The aircraft is descending through 3400' with vertical speed -2200 fpm.

The Speed || Altitude FMA is THRUST || V/S

The Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000' (Note: the aircraft will fly through the Altitude Bug)

The VS Bug on the PFD VS Tape is at the MCP VS at –3000 fpm

The Autopilot goal is DESCEND AWAY MCP ALT – ROD.

### Pilot Action:

FLY the aircraft to 3000'

- Monitor the Speed || Altitude FMA is THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000' (Note: the aircraft will fly through the Altitude Bug)
- Monitor the VS Bug on the PFD VS Tape is at the MCP VS at –3000 fpm
- Monitor the Autopilot goal is DESCEND AWAY MCP ALT – ROD.

### Pilot Action:

FLY the aircraft to 2700'

- Monitor the Speed || Altitude FMA is THRUST || V/S
- Monitor the Altitude Bug on the PFD Altitude Tape is at the MCP Altitude at 3000' (Note: the aircraft will fly through the Altitude Bug)
- Monitor the VS Bug on the PFD VS Tape is at the MCP VS at -3000 fpm
- Monitor the Autopilot goal is DESCEND AWAY MCP ALT – ROD.

**Event:**

Captain: "Immediate level-off."

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 34:**

What pilot action on the MCP is required to achieve the pilot goal of immediate level-off?

(Select one of the following)

- Dial MCP Altitude to 2000
- Dial MCP Altitude to 3000 and pull MCP Altitude Knob
- Rotate Vertical Speed Wheel to -250 fpm
- Push MCP Altitude Knob

**ANSWER THE FOLLOWING QUESTION  
DO NOT PERFORM ANY ACTIONS ON THE AP TUTOR**

**Question 35:**

What SPEED || ALTITUDE FMA will be displayed when the pilot pushes the MCP Altitude knob ?

(Select one of the following)

- THRUST || HOLD
- PITCH || IDLE
- THRUST || V/S
- PITCH || IDLE

Which of the following phrases will best reflect the goal of the Autopilot ?

(Select one of the following)

- ❑ MAINTAIN MCP ALT
- ❑ DESCEND MAINTAIN MCP ALT
- ❑ DESCEND MAINTAIN MCP ALT – ROD
- ❑ DESCEND MAINTAIN MCP ALT – CAP
- ❑ DESCEND AWAY MCP ALT 2 SECS – ROD
- ❑ DESCEND AWAY MCP ALT – ROD
- ❑ MAINTAIN CURRENT ALT

**Pilot Action:**

Push the MCP Altitude Knob

- Monitor the Speed || Altitude FMA reads THRUST || HOLD
- Monitor the Altitude Bug on the PFD Altitude Tape is set to the MCP Altitude at 1500'
- Monitor the VS Bug on the PFD VS Tape is at the MCP VS at –3000 fpm
- Monitor the Autopilot goal is to DESCEND MAINTAIN MCP ALT.

**Pilot Action:**

FLY the aircraft to the 1500'

FLY the aircraft vertical speed to zero

- Monitor the Speed || Altitude FMA reads THRUST || HOLD
- Monitor the Altitude Bug on the PFD Altitude Tape is set to the MCP Altitude at 1500'
- Monitor the Autopilot goal is to MAINTAIN MCP ALT.